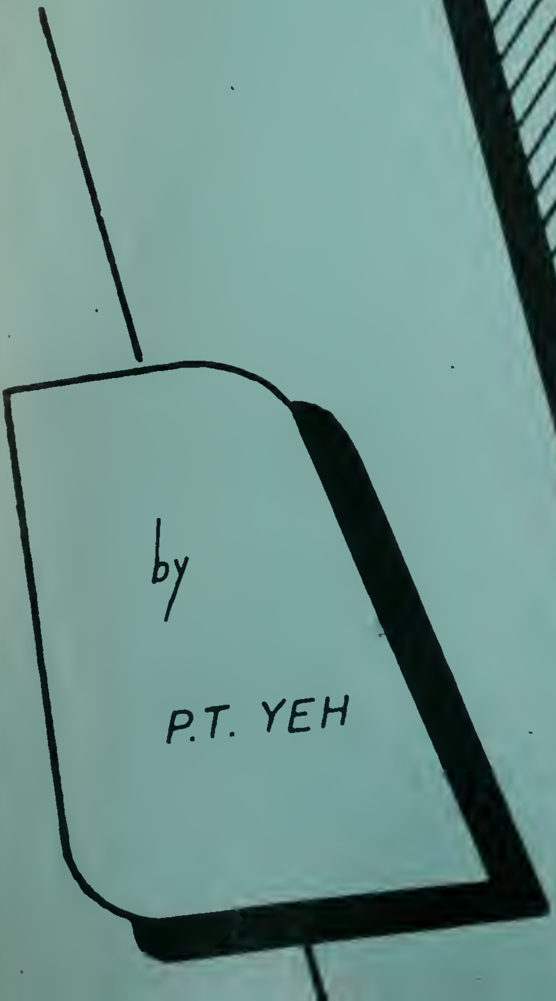
# AIRPHOTO INTERPRETATION
# OF
# ENGINEERING SOILS OF DEKALB COUNTY
# INDIANA

DEC. 1961
NO. 30

Joint
Highway
Research
Project

PURDUE UNIVERSITY
LAFAYETTE INDIANA



by

P.T. YEH

Final Report

# AIRPHOTO INTERPRETATION OF ENGINEERING SOILS OF
# DEKALB COUNTY, INDIANA

TO: K. B. Woods, Director
Joint Highway Research Project

FROM: H. L. Michael, Associate Director
Joint Highway Research Project

December 20, 1961

File: 1-5-2-14

Project No.: C-36-51E

The attached report entitled "Airphoto Interpretation of Engineering Soils of DeKalb County, Indiana," completes a portion of the project concerned with engineering soils mapping from aerial photographs. The report was prepared by P. T. Yeh, Research Engineer, Joint Highway Research Project.

The soils mapping of DeKalb County was done primarily by airphoto interpretation. To increase the value of the county soil maps, the major soil types were sampled and tests were conducted in the soils laboratory. The soil tests performed include grain-size analysis, liquid limit, plastic limit, standard AASHO Compaction and the California Bearing ratio test. The soils were classified using both the Unified Soil Classification System and the American Association of State Highway Officials System. Generalized soil profiles of the major soil groups were included on the soil map. An ozalid print of the engineering soils map and a summary table of the engineering test data are included in the report.

Respectfully submitted,

H. L. Michael
H. L. Michael
Associate Director

HLM:cw

Attachment

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# AIRPHOTO INTERPRETATION OF ENGINEERING SOILS

# OF

# DEKALB COUNTY, INDIANA

by

P. T. Yeh
Research Engineer

Joint Highway Research Project
Project No. C-36-51B
File No. 1-5-2 -34

Purdue University
Lafayette, Indiana

December 20, 1961

# AIRPHOTO INTERPRETATION OF ENGINEERING SOILS

# OF

# DEKALB COUNTY, INDIANA

by

P. T. Yeh

## INTRODUCTION

The engineering soils maps of DeKalb County, Indiana, which accompanies this report, was compiled from 7" x 9" aerial photographs having an approximate scale of 1:20,000. All of the airphotos were taken in 1939 in connection with the United States Department of Agriculture map program and were purchased from that agency.

The recessional moraine areas of the county had been mapped by Katsuyoshi Nishimura in his master's thesis entitled "Airphoto Pattern Study of the Erie Lobe Recessional Moraines in Indiana" (1). Revisions and details were added to these morainic portions, and the remaining area of the county was mapped to complete the engineering soils map.

Photo interpretation of the land forms and soil textures of this county was accomplished in accordance with accepted principles of observation and inference (2). Field trips were made to the area for the purposes of resolving ambiguous details, correlating airphoto patterns with soil textures, and to secure soil samples. Test data included herein were obtained from laboratory testing accomplished on these samples, unless otherwise noted. Standard mapping symbols developed by the staff of the Airphoto Interpretation Laboratory, School of Civil Engineering, Purdue University, were employed to delineate land forms and soil textures. The text of this

report largely represents an effort to overcome the limitations imposed by adherence to a standard symbolism.

An approach towards better utilization of engineering soil maps of Indiana has been attempted with the inclusion of soil profile and laboratory classification for the principle soils represented within this county. Certain soils, of obvious inferior engineering qualities, were not sampled but were indicated on the attached map. The profile was compiled from the agricultural literature. These soils include principally organic materials such as muck, peat and highly organic lacustrine soils which are of only limited extent.

## INTERPRETATION OF AREA

### General

DeKalb County is located in the northeastern part of the State as shown in Figure 1. It is rectangular in shape, with a length of about 20 miles (east - west) and a width of 18 miles (north - south). The total area is 369 square miles approximately (8, p. 195). Auburn is the county seat. A population of 28,271 inhabitants resided within the county, with 6350 reported for Auburn alone, according to the 1960 census (10).

According to the 1950 census of Agriculture, there were 217,934 acres of farm land, (about 93.3% of the county area) in DeKalb County (9). Wooded areas are scattered throughout the county in small patches as shown in Figure 2.

### Drainage Features

The principal stream of DeKalb County is the St. Joseph River, a tributary of the Maumee River, which cuts across the southeastern corner of

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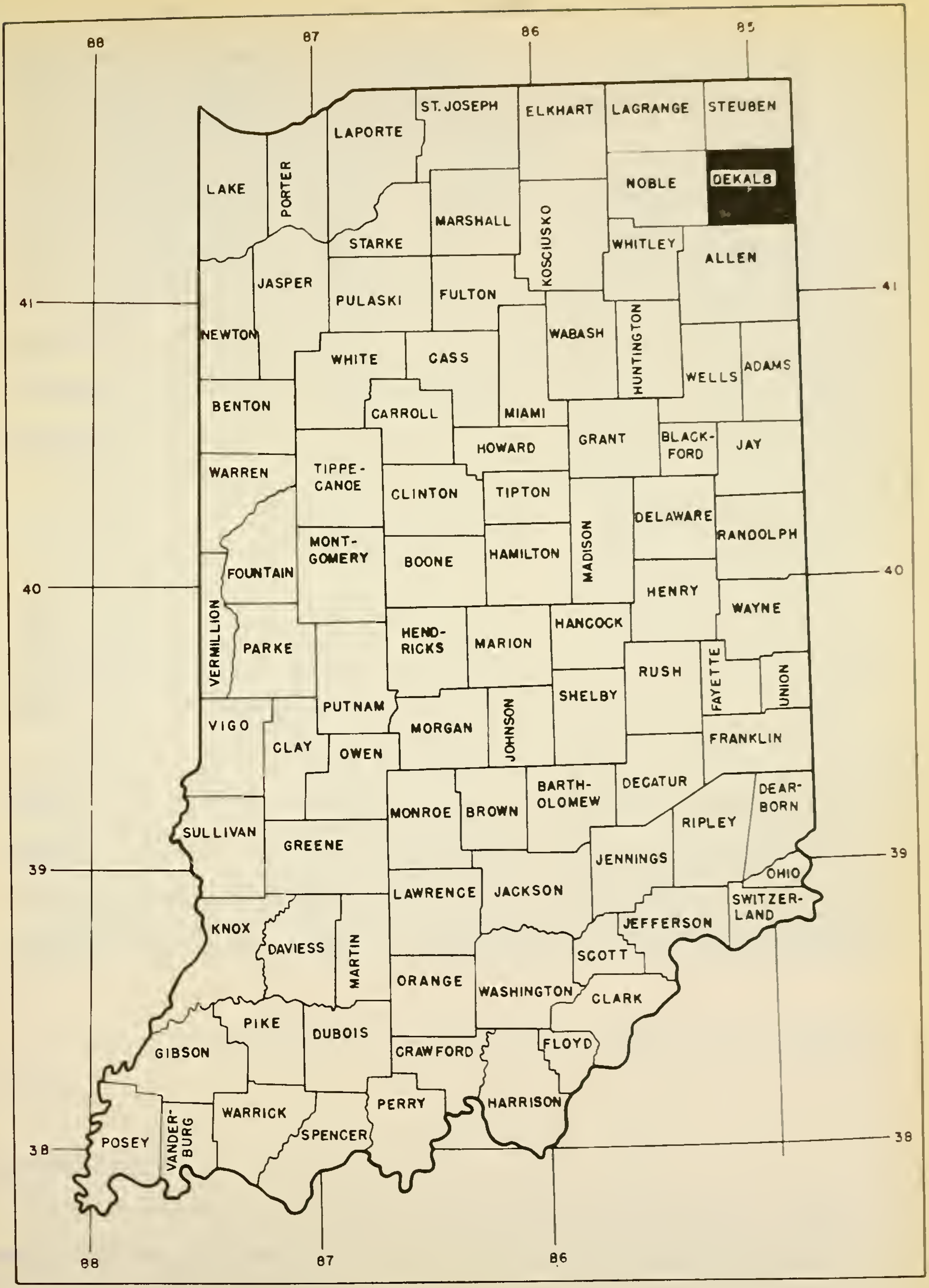


FIG. 1. LOCATION MAP OF DEKALB COUNTY

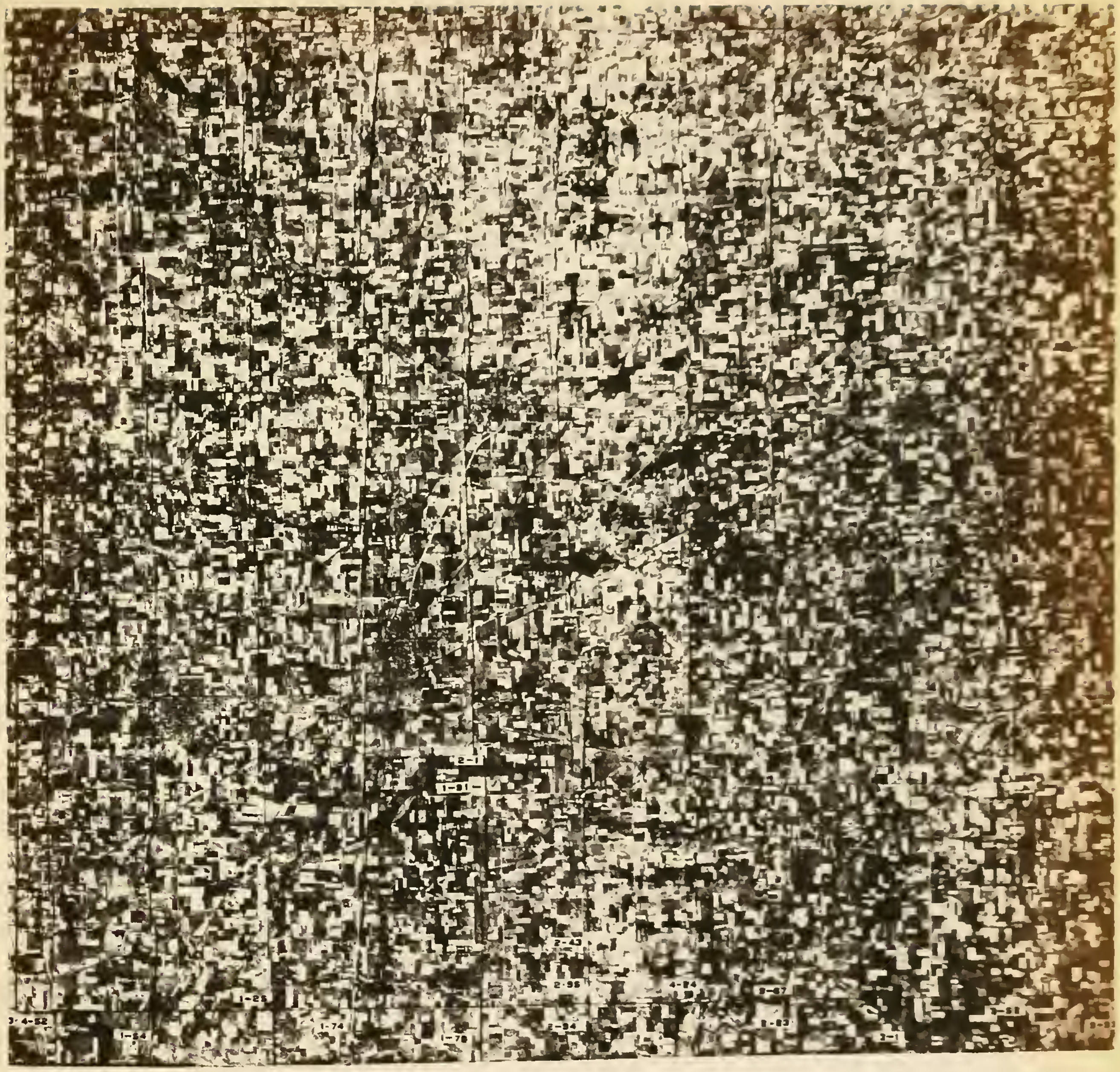


FIG. 2 AIRPHOTO MOSAIC OF DEKALB COUNTY

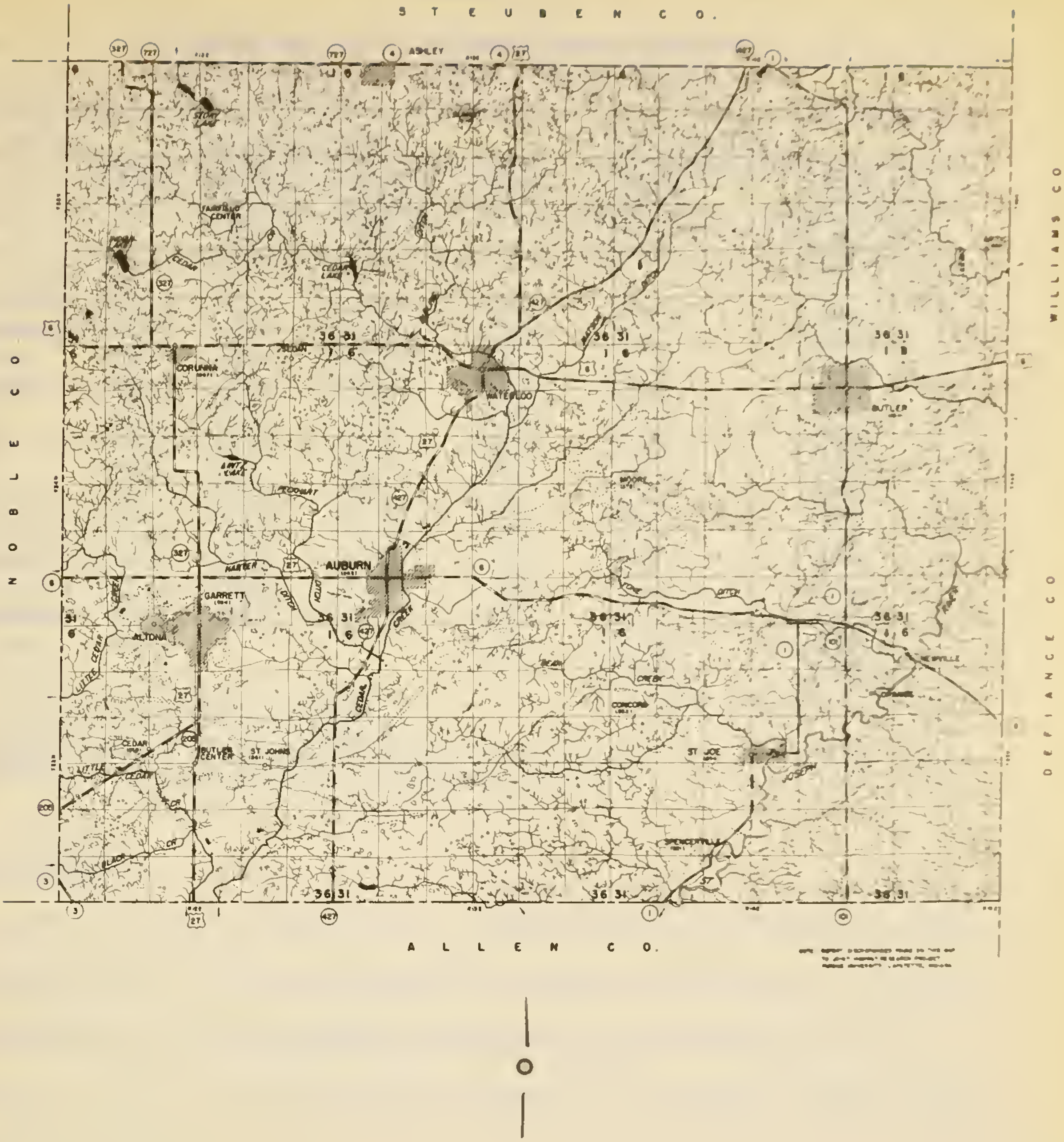
FROM 1939 INDEX MAP

the county and flows in a southwesterly direction (Figure 3). With Cedar Creek, its major tributary, the St. Joseph River carries nearly the entire runoff water of DeKalb County. The waters flow eventually into Lake Erie. A small area of about 12 square miles in the northwestern corner of the county drains into Lake Michigan through Pigeon River to the north.

Lakes are smaller in size and fewer in number in DeKalb County than Steuben County, its northern neighbor. They are located mostly within the Salamonie morainic region in the northwestern quarter of the county. Story Lake and Indian Lake are the two largest lakes in the county. A large number of lakes are being rapidly encroached upon by the growth of aquatic vegetation. The lakes are approaching extinction, and in a few generations will become swamps or converted to farm lands by intensive ditching.

Climate

DeKalb County has a continental climate. The variations between winter and summer temperatures are wide, ranging from a maximum of 102 degrees to a minimum of -14 degrees. The average annual precipitation is 36.30 inches. The normal monthly and annual temperature and precipitation at Waterloo (11) are given in the following table:



DRAINAGE MAP

DEKALB COUNTY

INDIANA

PREPARED FROM

1938 AAA AERIAL PHOTOGRAPHS

BY

JOINT HIGHWAY RESEARCH PROJECT

AT

PURDUE UNIVERSITY

1953

SCALE OF MILES

FIG. 3

## TABLE 1

## NORMAL MONTHLY AND ANNUAL TEMPERATURE AND PRECIPITATION AT WATERLOO, DEKALB COUNTY, IND.

| Month | Temperature* | | | Precipitation | | |
|---|---|---|---|---|---|---|
| | Mean °F | Average Maximum °F | Average Minimum °F | Mean Inches | Total Driest Year Inches | Total Wettest Year Inches |
| January | 25.8 | 32.5 | 19.0 | 2.30 | 1.61 | 2.11 |
| February | 21.3 | 29.0 | 13.5 | 2.30 | 1.20 | 3.43 |
| March | 35.4 | 42.9 | 27.8 | 3.10 | 3.07 | 6.44 |
| April | 48.6 | 60.8 | 36.4 | 3.10 | 2.75 | 2.09 |
| May | 58.1 | 73.5 | 42.6 | 3.80 | 3.68 | 1.83 |
| June | 63.6 | 75.4 | 51.8 | 3.70 | 1.95 | 6.03 |
| July | 71.7 | 81.2 | 62.2 | 3.50 | 3.44 | 6.15 |
| August | 69.4 | 80.8 | 37.9 | 3.10 | 3.19 | 6.24 |
| September | 63.2 | 74.6 | 51.8 | 3.30 | 1.25 | 4.74 |
| October | 53.6 | 66.8 | 4.03 | 2.60 | 1.30 | 2.03 |
| November | 42.6 | 50.8 | 32.4 | 2.90 | 1.66 | 3.84 |
| December | 21.0 | 29.9 | 12.1 | 2.60 | 1.11 | 2.51 |
| Annual | 47.8 | | | 36.30 | 26.21<br>(in 1953) | 48.80<br>(in 1942) |

* Record at elevation of 908 ft,
These data are derived from 13 years of temperature (1940-1953) and 20 years of precipitation (1938-1958) records.

### Physiography

DeKalb County is located in the Steuben Morainal Lake section of the northern moraine and lake physiographic region of the state (4, p. 66). With respect to its physiographic situation in the United States, the county is a part of the Eastern Lake section of the Central Lowland province (4, p. 69).

### Topography

The surface of DeKalb County is sloping gradually from NW to SE as shown in Figure 4. The high point (1,025 ft.) of the county is located on the northwestern corner while the lowest elevation (775 ft.) occurs at the southeastern corner. Between these limits the relief of the surface

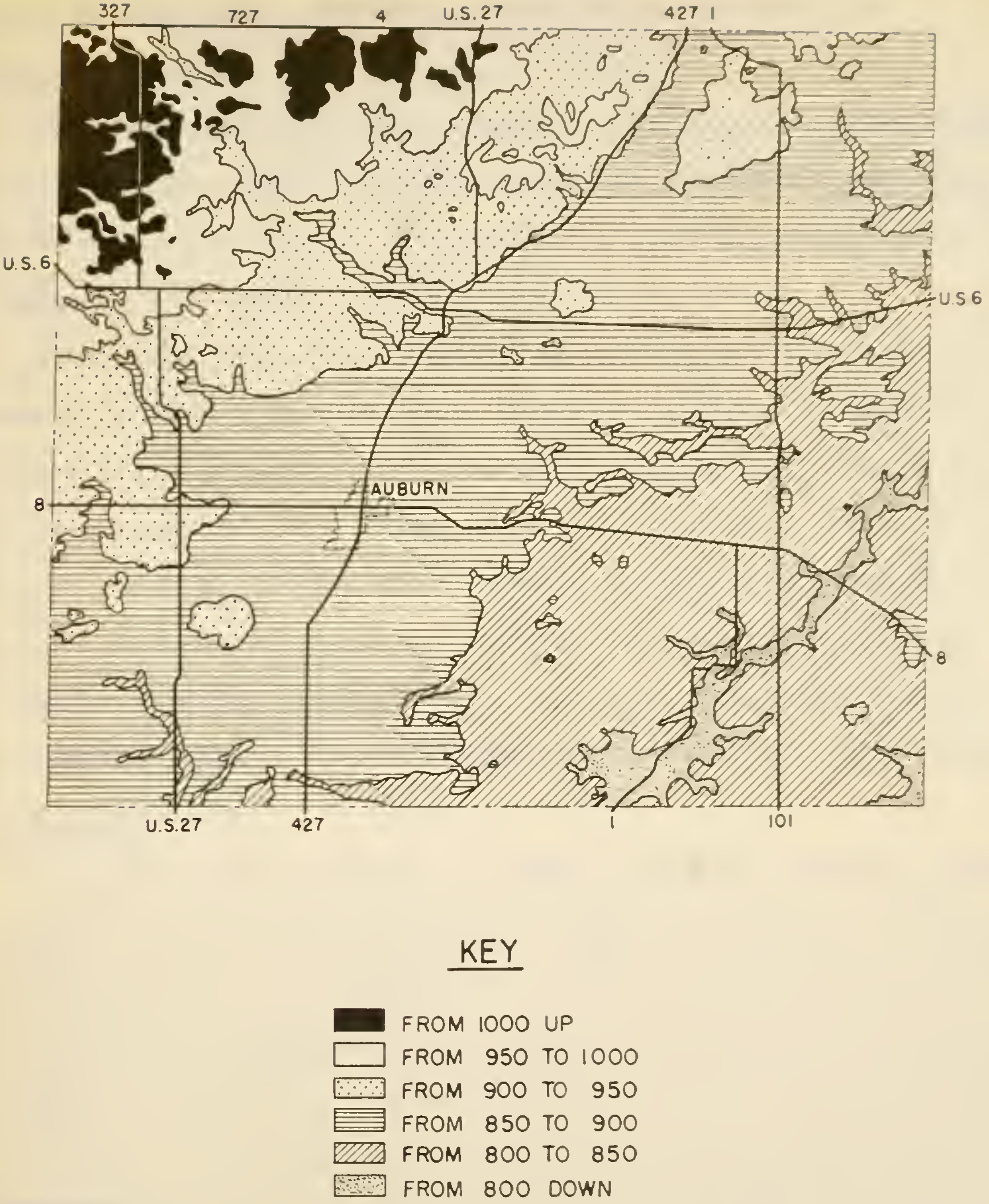


FIG. 4 TOPOGRAPHIC MAP OF DEKALB CO.

(CONTOUR INTERVAL 50')

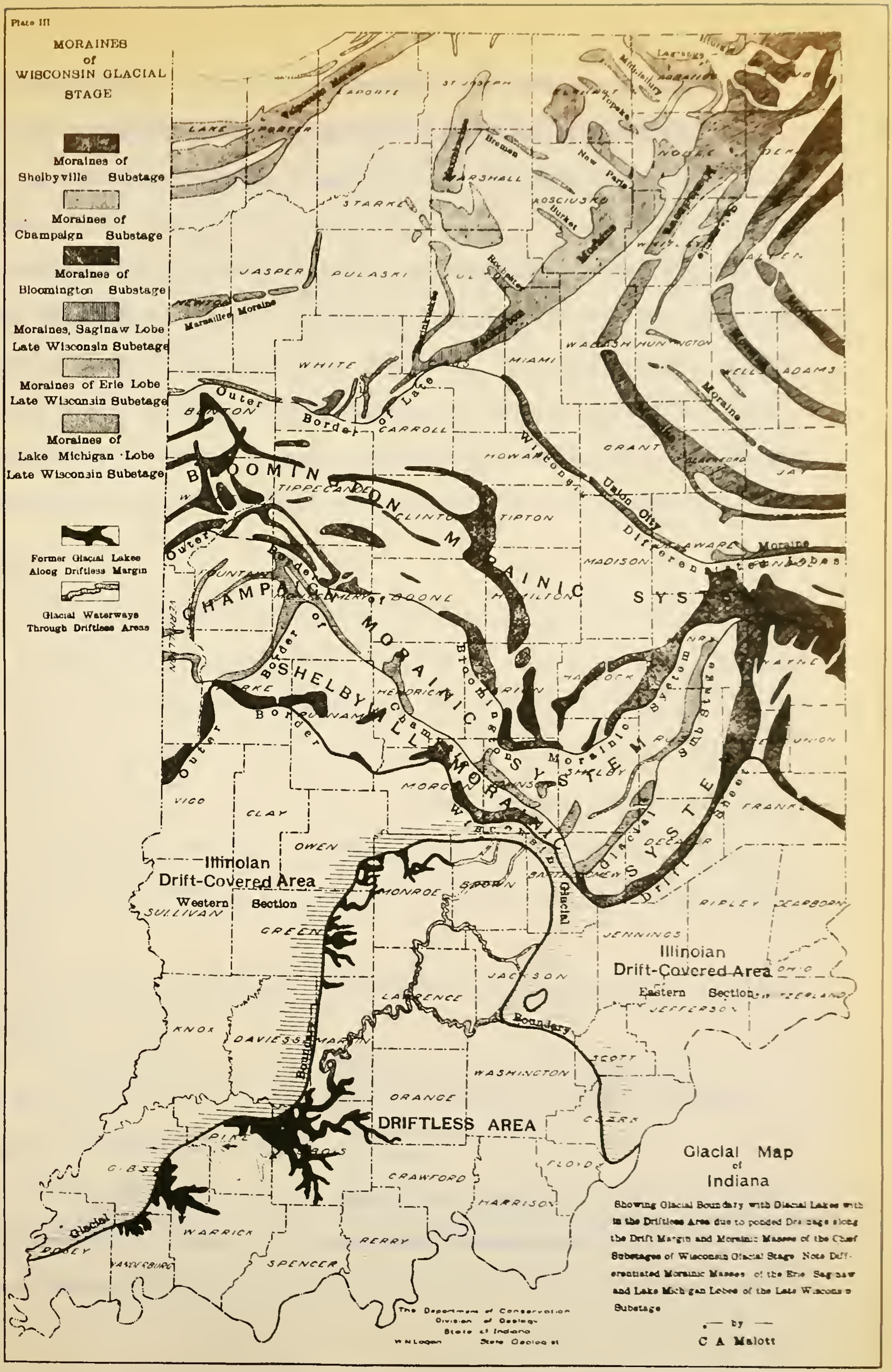
consists of three parallel, low ridges with two intervening plains which cross the county in a southwesterly direction as shown in Figure 5. Maximum local relief is seldom in excess of 100 feet.

The first ridge (Fort Wayne Moraine) is about four and one-half miles in width located between the former Maumee Lake and the St. Joseph River at the southeastern corner. It presents a gently undulating surface. The elevation at the summit is about 60 ft. above the river.

The second ridge (Wabash Moraine) is about eight miles wide. This ridge is bounded on the west by the Cedar Creek valley. The crest of this ridge within a mile or two of its western border, is about 125 feet above the St. Joseph River, and 60 feet above Cedar Creek (3, p. 99). This moraine is also weak in topographic expression except at the northeastern corner of the county where Fish Creek cuts deep into the moraine. In general, the surface of this moraine varies from gently undulating to occasionally rolling. Numerous swamps and depressions are present within this morainic belt.

The third ridge (Mississinewa Moraine and Salamonie Moraine) is more massive and elevated. The moraine is triangular in shape with width increases from zero at the southwest to 15 miles across the northern border. Its summit (interlobate area) located at the northwestern corner of the county is over 1,000 ft. above sea level, and from 100 to 150 ft. above Cedar Creek. The topography is strongly morainic and characterized by high irregular ridges, abrupt slopes, deep winding valleys and numerous lakes.

The St. Joseph River valley and adjacent plains are located between the Fort Wayne and Wabash moraines. This valley is about one-half of a mile in width. The bluff is about 35 ft. high from the surface of the



Glacial Map of Indiana

Showing Glacial Boundary with Glacial Lakes within the Driftless Area due to ponded Drainage along the Drift Margin and Morainic Masses of the Chief Subetages of Wisconsin Glacial Stage. Note Differentiated Morainic Masses of the Erie, Saginaw and Lake Michigan Lobes of the Late Wisconsin Subetage

— by —

C A Malott

FIG. 5 GLACIAL MAP OF INDIANA

St. Joseph River. A long and continuous terrace about one-quarter mile in width is located on the east bank of the river. Low sand dunes are found on top of the terrace, especially near the eastern border of the county.

A large plain is located between the Wabash Moraine and the interlobate morainic area to the northwest. This plain is a ground moraine with the Cedar Creek valley on its eastern border. The ground moraine varies in width from five miles at the southwestern corner to less than a mile at the northern border. It has a gently rolling to undulating topography. Small and scattered terraces are found on both sides of Cedar Creek.

## Geology

The bedrock formations of DeKalb County are composed of sedimentary rock formations of Mississippian age in the northern part and of Devonian age in the southern part of the county. The Pleistocene deposits of glacial drift which overlies the eroded surface of the bedrock attains a thickness in excess of 300 ft. (12). Borings for gas indicate that the drift thickness is 280 ft. at Auburn, 378 ft. at Garrett and at Butler, and 365 ft. at Waterloo (3). There is no outcrop of bedrock within the county.

The following geological divisions have been recognized in deep well records (12, p. 107).

| | |
|---|---|
| Quaternary | Recent, sands, clays and soils<br>Pleistocene, sands, clays, gravels |
| Mississippian | Shales and sandstone<br>Limestone |
| Devonian | Shale (New Albany)<br>Limestone (erian, Sellersburg, Jeffersonville)<br>Sandstone (Schoharie) |

| | |
|---|---|
| Silurian - - - - - - | Shales and Limestones |
| Ordovician - - - - - | Shales and limestones (Richmond)<br>Limestones (Trenton) |

## AIRPHOTO INTERPRETATION OF SOIL AREAS

Soils in DeKalb County are derived chiefly from glacial deposits. However, an appreciable amount of glaciofluvial and alluvial deposits are recognized along the major drainage channels. Only a very limited extent of eolian deposits are found within this county.

### GLACIAL DEPOSITED MATERIALS

DeKalb County is covered entirely by deep glacial drift. The characteristics of the drifts vary considerably with their form of deposition and the source of the glacier. The various deposits are discussed as follows.

#### Kettle-Kame Moraine

The kettle-kame moraines are located in the interlobate morainic [illegible] of the Salamonie and Mississinewa moraines in the northwestern quarter of the county. The landscape varies from rugged kettle-kame topography to moderately irregular hills and swales.

Parent materials in this area are generally coarse textured with variable amounts of a clay soil profile development. Pedologically, soils of this region belong to the Fox and Miami series. The typical soil profile is represented by site No. 20. Beneath the loamy top soil at site No. 20 the subsurface soil at a depth of 15 to 39 inches from the surface, consists of 40% clay, 21% silt, 36% sand and 3% of gravel (see Table II). It is a low plastic, lean clay (LL of 29% and PI of [illegible]%) and is classified

as A-6(7). It exhibits a CBR value of 7 at 15% moisture. The parent material obtained from a depth of 39 to 72 inches is non-plastic sand. It contains 13% of gravel, 79% sand, 5% silt and 3% of clay. The CBR value at a moisture content of 10% is 26. This soil is classified as sand (A-1-b). Pedologically the soil is a Fox sandy loam, kame phase. Several gravel pits are located in this region.

Ridge Moraines

Ridge morainic deposits occupy about two-thirds of the area of DeKalb County. They can be subdivided into different textural groups, namely: the gravelly textured moraine, the sandy textured moraine, the silty textured moraine and the clayey textured moraine. Each group is discussed in detail as follows.

Gravelly textured ridge moraine.

Ridge moraines containing coarse textured soils and parent materials occur mainly in the northwestern quarter of the county. A small area is also located at the northern tip of Fish Creek in the northeastern corner of DeKalb County. They are associated with the kettle-kame moraines. Ranging from low hills and swales to pitted surfaces, the topography is much more subdued than that of the kettle-kame moraine.

Engineering soils of this area, in general, are sandy to gravelly in texture. They belong to the Fox and the Miami series pedologically. Soil samples taken at sites No. 18 and 32 reveal the granular character of the deposit. At site No. 18, under the sandy loam top soil, a gravelly sandy clay soil is found. It contains 29% gravel, 39% sand, 15% silt and 17% clay. The B-horizon exhibits low plasticity (PI 8%). It is classified as A-2-4. The parent material is a non-plastic, well graded, gravelly

sand, classified as A-1-b soil. The amount of gravel and sand increases to 42% and 49% respectively, in the C-horizon while silt and 5-micron clay decreases to 5% and 4%. The laboratory CBR value also increases substantially from a value of 11 representing the B-horizon to 50 within the C-horizon. Soil samples taken at site No. 32 show loose gravel within the B-horizon and are classified as sandy clay loam A-4(1) while the parent material is a poorly graded gravelly sand classified as A-1-b. Gravel pits are also located in this region.

Sandy textured ridge moraine.

Sandy textured ridge moraine deposits are found also at the north-western corner of DeKalb County. The topography varies from rugged, rolling hills near muck channels to more undulating hills on the more open upland. Deeply eroded gullies may be found near some mucky depressions particularly in the area south of Ashley. The cohesionless sandy deposit is clearly indicated. About eight feet of sand is found in a highway cut one mile south of Ashley.

Soil in this area is chiefly of the Miami series. The surface soils vary from sandy loam to loam or silty clay loam. In general, coarser textured soils are found near the northwest and finer textured soils are deposited to the southeast. The sand is not homogeneously mixed in the soil but deposited in seams or lens in a clay loam drift. Soil samples taken at sites No. 17 and 19 illustrate this fact.

At site No. 17 under the fine sandy loam top soil the B-horizon, taken from 12 to 24 inches, is a clay loam soil classified as an A-4(6) soil. A lens of sand is found immediately below. The parent material taken at a depth from five feet to six and one-half feet is a non-plastic silty gravelly sand classified as A-4(1) soil by the AASHO system.

A more clayey subsurface soil is found at site No. 19. The B-horizon taken between one to three feet from the surface contains no gravel and is classified as a clay soil A-6(11). A three and one-half foot lens of sand is deposited beneath the B-horizon. The parent material is a clay loam soil. The plasticity of the soil is rather low (LL of 21% and PI of 8%). It belongs to the A-4(4) soil group.

Another sample taken at site No. 21 located close to a creek is somewhat more sandy and gravelly in texture. The B-horizon is low in plasticity and is classified as A-4(5) soil. The C-horizon taken from five to seven feet is a non-plastic gravelly silty loam. It is classified as A-4(3) soil. Only a few gravel pits are located in this region. They are widely scattered.

### Silty textured ridge moraine.

Silty moraines are associated closely with the sandy moraines in the northwestern part of the county. It is difficult to separate them accurately from the sandy textured material. However, due to the less impervious nature of the soil, surface drainage development is better established than that of the sandy moraine. Thus, surface drainage development provides the important clue for the delineation of this deposit. The topography of this region varies from rolling to undulating.

Pedologically the soils in the silty moraine belong to the Miami loam and Miami silt loam with Crosby and Brookston soil in the less sloping and depressional areas. Sand lenses are absent and the soil is more uniform in texture. The subsurface soils are plastic silty clay A-6 soil and the parent materials are low plastic silty clay A-4 soil.

### Clayey textured ridge moraine.

Moraines deposited by the Erie Lobe contain considerable amounts of shale and are more clayey in texture than the deposits of the Saginaw Lobe

to the west. DeKalb County, except the northwestern corner, has been invaded by the Erie Lobe. Three recessional morainic belts are identified as the Fort Wayne Moraine, the Wabash Moraine and the Salamonie Moraine successively from the southeast toward the northwest (see Figure 5).

The Salamonie Moraine which rests against and is coalescent with the Mississinewa Moraine exhibits morainic topography that varies from hilly to rolling near the major drainage channels to undulating toward the ground moraine on the east. East of Cedar Creek, the landscape becomes more gentle. However, more rugged morainic expression can be found along several muck chains diagonally crossing the morainic belt.

The major soil in the clayey moraine belongs to the Morley-Blount-Pewamo catena. Samples taken from sites No. 16, 22, 28, 29, 30, 31 and 13 show that deposits of these moraines are fine textured and that the B-horizon may vary from A-6(8) to A-7-6(14). The parent material is classified as lean clay, A-6(7) to A-6(11). However, at site No. 31, due to local variation, the amount of sand and gravel increases but the plasticity index increases to 23%. The soil at this particular sample is classified as sandy clay within the A-7-6(6) soil group.

Ground Moraines

The ground moraines (generally referred to as till plains) are found in DeKalb County. The larger one lies between the Wabash Moraine and the Salamonie Moraine. The other is located on the northeastern corner of the county. The major part of the ground moraine is clayey in texture. A somewhat silty deposit is found in limited areas.

Silty textured ground moraine.

The silty textured ground moraine deposits within DeKalb County occur in small patches. The largest tract is located northeast of Waterloo.

Topography varies from gently rolling to undulating. In places, however, hilly expression may be found especially in the dissected area adjacent to the drainage way east of Butler.

A typical soil profile is represented by site No. 23. Under nine inches of silty clay loam top soil, the B-horizon, taken from 9 to 24 inches, is a silty clay. The soil is classified as an A-6(8) soil group. The C-horizon, taken from 24 to 36 inches, is silty (LL of 23% and PI of 7%) and is classified as an A-4(6) soil.

A soil profile taken at site No. 7 is essentially the same as that at No. 23. Soil samples taken further south (at site No. 4) is more silty in the subsurface soil and more clayey in the parent material. It is classified as an A-4(7) for the B-horizon and an A-6(9) soil for the parent material.

Pedologically the soil of this deposit predominately belongs to the Blount and Pewamo silty clay loam.

### Clayey textured ground moraine.

Clayey textured ground moraines occupy the major portion of the southwestern quarter and the northeastern corner of the county. A gently rolling topography is found within the areas south of Little Cedar Creek and those areas immediately east of the Salamonie Moraine located west of Garrett. The topography becomes undulating and more subdued toward the northeast. At the northeastern corner the landscape is nearly flat or level.

Blount, Pewamo, St. Clair and Nappanee are the major soil series of this deposit. Soil samples taken from sites Nos. 3, 9, 26 and 27 located in the high spots indicate that the parent materials are remarkably alike. The gravel content varies from 2 to 4%, much less than that of the ridge

moraine soils. The sand, silt and clay vary in a very narrow margin (sand 16-24%; silt 31-33%; and clay 43-50%). The parent material is classified as an A-6(11) soil.

The B-horizon contains somewhat more clay (41-54%) and is classified into the A-7-6(13-14) soil group.

Samples at sites Nos. 8, 11, 14 and 15 are taken on the lower topographic position in the ground moraine. Site No. 11 located just at the foot of a ridge moraine to the west shows a more sandy and less clayey B-horizon than the C-horizon directly below. The B-horizon is classified as an A-6(11) soil while the C-horizon is an A-7-6(12) soil.

Site 14 is located within a depression. The upper horizon is derived from wash-in soil. Immediately below the surface layer a very plastic black clay is found from 36 to 72 inches and muck or peat deposits underly the area. The black plastic clay contains 5% of sand, 35% of silt and 60% of clay and exhibits a liquid limit of 92% and a plasticity index of 55%. It is classified as a fat clay or A-7-5(20) soil. Pedologically the soil belongs to the Wasthenaw series.

The sample taken at site No. 15 is on the slope about 50 ft. south from site No. 14. Both the B- and C-horizon taken from 9-30 inches and from 30-42 inches respectively show about the same textural composition. The B-horizon is classified as clay A-7-6(15) soil and the parent material an A-7-6(13) soil.

Site No. 8 is somewhat different from the rest. The surface soil is mixed with many small and large pebbles. The B-horizon taken from 18 to 42 inches contains a little less clay than the C-horizon taken at 42 to 48 inches. The parent material is a lean clay in the A-6(8) soil group. This situation may be attributed to the fact that the sampling

site is located within a local outwash area as the site is slightly lower topographical than its surrounding land.

### Eskers and Kames

Although many kames exist in DeKalb County, they are located mainly in the kettle-kame morainic belt, therefore, it is impractical to outline each individually on the map. There are a few short and small eskers in this county. They are very easily to delineate, and are shown individually on the soils map. Almost all of them are located near the drainage channels in the northwestern quarter of the county. Gravel pits are located within the eskers. The soils developed on these formations are generally of the Fox series. The typical profile is about the same as that of the kettle-kame moraine.

## WATER DEPOSITED MATERIALS

Water deposited materials are very limited in extent in DeKalb County. They are generally associated with the present drainage ways. Four different land forms created by the action of water, namely the outwash plain, the terrace, the lacustrine plain and the alluvial plain are discussed as follows.

### Outwash Plains

Only a few, scattered, small outwash plains exist in DeKalb County. The largest is located west of Fish Creek north of Butler. The others lie west of Auburn and west of Ashley. The topography varies from an undulating, pitted plain to a smooth level plain. Muck, kettle depressions and infiltration basins occur frequently.

The soils on the outwash plain are generally of the Fox series. A typical profile is represented by site No. 25. The B-horizon taken between 9 to 30 inches is a low plastic gravelly sandy clay soil (A-2-4). The stratified parent material from 30 to 81 inches shows a composition that is classified as gravelly sand (A-1-b).

Another sample taken at site No. 12 indicates the variability of the deposits. The B-horizon consists of dirty sandy gravel while stratified sand and gravel parent material is encountered about four feet from the surface. It is classified in the A-1-b soil group.

Along the western border of the Wabash Moraine northeast from Waterloo, there is a narrow strip of outwash material. The surface is nearly level and smooth, and merges inconspicuously with the ground moraine to the west. It serves as a drainage basin for the ridge moraine on the east and the undulating ground moraine to the west. In slightly depressed areas, organic materials occur on the surface of the deposit.

This deposit is essentially the same as the outwash deposit previously mentioned. However, the texture of the deposit especially in the upper layer contains more silt and clay and stratification of the deposit is not distinctly present.

Soils in this region belongs to the Mill Creek series. The B-horizon taken from 6 to 30 inches at site No. 24 is classified as sandy loam or A-2-4 soil. Both gravel and sand content increase in the C-horizon taken from 30 to 42 inches. The soil classifies as a gravelly sandy loam (A-2-4).

### Terraces

Terraces are found along all the major drainage channels in DeKalb County. They are generally narrow and discontinuous. The flat bench-like

topography is absent in many areas. Current markings and infiltrations are present on most areas. The terraces are composed generally of stratified sands and gravels. However, the upper portion of the terrace usually exhibits a cover of silty clay material. This overburden varies in depth from 2 to 8 feet or more. The overburden is thinner toward the channels and thicker toward the upland. The composition of the terrace deposit varies greatly from place to place. In general, the overburden is considered as thin along the Little Cedar Creek south of Garrett and in the vicinity of Waterloo. Gravel pits are located on the terrace in the southwestern corner of the county.

Pedological soils of the terrace are generally of Fox, Boyer and Oshtemo series and the Ockley, Westland and Abington series. The former catena has a thiner A- and B-horizon while the latter one has a thicker and more clayey overburden.

Samples taken at sites 1 and 5 have a shallow A- and B-horizon. Deeper overburden is found at sites 2, 6 and 10. The B-horizon is remarkably similar and is classified as an A-2-4 soil, however, in site No. 1 a slightly more plastic B-horizon is present.

The parent materials vary from a poorly graded gravelly sand to a well graded gravelly sand and gravelly silty sand (A-1-b to A-3) soil.

Lacustrine Plains

There are very limited lacustrine plain deposits in DeKalb County. The one located on the southeastern corner is part of the huge Maumee Lake that extended from Allen County to the south. The others are located along the valley of the Little Cedar Creek in the southwestern quarter of the county. The lacustrine plain deposits generally exhibit an extremely flat surface and a uniformly dark color tone.

Since lacustrine plain deposits are very limited in DeKalb County no sample was obtained. Pedological soils in the area belong to the Bono and Pewamo series.

## Alluvial Plain

Practically all drainage channels possess recent alluvial plains (floodplains); however, only those of considerable size are shown on the soils map because of scale limitation.

The largest alluvial plain in DeKalb County lies along the St. Joseph River. Current markings and river bar deposits can be observed. Along other creeks most alluvial plains are flat and uniformly gray in photo tone.

The textures of the alluvial deposits varies greatly from one place to the other. Top soil varies from loam to silt loam. On the higher plains, where flooding is less frequent, subsoil varies from silt loam to silty clay loam. In areas subjected to frequent flooding, the material may range from loam, to sandy loam, to silt loam to silty clay loam. Stratification may be observed occasionally, and clean sand and gravel may be found below a depth of 5 or 6 feet. This is especially true along the St. Joseph River where a number of new gravel pits are located on the alluvial plain. Pedologically the alluvial soils are classified as Genesee, Eel, Shoal, Sloan and Griffin soil. The engineering soils are classified as predominantly A-4 soil groups.

## WIND DEPOSITED MATERIAL

There is a very limited extent of wind blown sand deposits within the county. Sand dune formations are located on the terrace at the northern

end of the St. Joseph River. The wind blown sand is classified as Plainfield or Princeton soil by the agronomist. The nearly uniform sand is considered as a poorly graded sand within the A-3 soil group by the engineers.

## MISCELLANEOUS FORMATIONS

### Peat and Muck Depressions

The chief organic soil of DeKalb County is muck that occurs in many of the kettle depressions. Peats are found underlying the decomposed muck in many places where oxidation is very slow or ineffective.

The distribution of peat and muck deposits are almost uniformly spread throughout the county. In many occasions, the kettle depressions form a chain-like orientation. Three distinct muck chains can be recognized within the Wabash Moraine between Cedar Creek and the St. Joseph River.

The peat and muck soil in DeKalb County is recognized as Carlisle muck, Linwood muck and Edward muck by the agronomist. Most of the peats are formed of Sphagnum mosses. The deposits range in depth between 4 to 25 feet, and occasionally even up to 44 feet (13). Overlying the unweathered peat is the disintegrated muck formation. Marl from 1 to 3 feet in depth may be found underlying the peat and muck deposits in some areas. Marl is a soft earthy material composed principally of an amorphrous form of calcium carbonate. Since it is also undesirable from the engineering standpoint, no separation is made from the peat and muck in the general soil profile.

Since the size and depth of these deposits varies greatly, field investigation for each individual deposit is necessary before final design is made.

## Highly Organic Top Soils

Depressed areas, where internal drainage is somewhat retarded by the high ground water table, give rise to the accumulation of considerable amounts of organic top soil. There are a number of such areas in DeKalb County. Most of them are located next to the muck pockets. The parent material underlying the organic top soil is essentially the same as those of the surrounding mineral soil areas. Soil samples taken at site No. 29 verifies this point.

The top soil is a black highly plastic organic silty clay about 8 inches in depth. Soil in the B-horizon is a plastic clay that is classified as an A-6(14) soil. The parent material is essentially the same as the surrounding clayey moraine. It is classified as clay in the A-6(11) soil group. Pedologically this soil deposit belongs to the heavy subsoil Pewamo series.

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| Site No. | Horizon | Depth in Ft. | Gr<br>% Re | CBR<br>- 15#<br>- 20#<br>- 25#<br>- 30#<br>- 35# | Moisture Content for CBR Test | Unified Classification | AASHO Classification |
|---|---|---|---|---|---|---|---|
| 1 | B | 3/4-2 | | $21^{5}$ | 12.0 | SM-SC | A-2-4 |
| | C | 2-4 | | $18^{5}$ | 11.5 | SW-SM | A-1-b |
| 2 | B | 1 1/2-2 | | $32^{2}$ | 10.0 | SM | A-2-4 |
| | C | 3-8 | | $27^{5}$ | 9.5 | SW-SM | A-1-b |
| 3 | B | 1 1/2-2 1/2 | | $6^{5}$ | 18.3 | CL | A-7-6(13) |
| | C | 3-4 | | $6^{5}$ | 17.1 | CL | A-6(11) |
| 4 | B | 1-2 1/2 | | $7^{3}$ | 14.3 | CL | A-4(7) |
| | C | 2 1/2-4 | | $7^{5}$ | 14.8 | CL | A-6(9) |
| 5 | B | 3/4-2 1/2 | | -- | -- | SM | A-2-4 |
| | C | 2 1/2-4 | | $36^{1}$ | 10.3 | SM | A-1-b |
| 6 | B | 1 1/2-6 | | $19^{2}$ | 9.1 | SM | A-2-4 |
| | C | 6-7 | | $20^{3}$ | 12.7 | SP-SM | A-3 |
| 7 | B | 1 1/2-5 | | $6^{5}$ | 19.9 | CL | A-6(9) |
| | C | 5 1/2-8 | | $3^{5}$ | 12.9 | CL | A-4(6) |
| 8 | B | 1 1/2-3 1/2 | | $4^{5}$ | 14.9 | CL | A-6(5) |
| | C | 3 1/2-4 | | $3^{5}$ | 17.1 | CL | A-6(8) |
| 9 | B | 1-2 | | -- | -- | CL | A-7-6(14) |
| | C | 2-2 1/2 | | $4^{5}$ | 17.9 | CL | A-6(11) |
| 10 | B | 1 1/2-3 | | $6^{5}$ | 11.2 | SM | A-2-4 |
| | C | 10-13 | | $22^{5}$ | 9.9 | SP-SM | A-1-b |
| 11 | B | 1-3 | | $4^{5}$ | 20.3 | CL | A-6(11) |
| | C | 3-4 1/2 | | $4^{4}$ | 23.4 | CL | A-7-6(12) |

## TABLE II

## SOIL TEST DATA FOR DEKALB COUNTY

| Site No. | Horizon | Depth in Ft. | Grain Size Distribution: Gravel % Retained on #4 | Fine Gravel % Retained #4-#10 | Coarse Sand % Retained #10-#40 | Fine Sand % Retained #40-#200 | Silt % #200 0.005 mm | Clay % #200 mm | Liquid Limit % | Plastic Index % | Standard Laboratory Compaction (AASHO T99): O.M.C. % | Max. Dry Weight pcf | CBR 1 - 15# 2 - 20# 3 - 25# 4 - 30# 5 - 35# | Moisture Content for CBR Test | Unified Classification | AASHO Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B | 3/4-2 | 6 | 10 | 26 | 30 | 10 | 18 | 23 | 7 | 12.5 | 116.0 | 21 $^{5}$ | 12.0 | SM-SC | A-2-4 |
|  | C | 2-4 | 20 | 13 | 39 | 20 | 5 | 3 | NP | NP | 12.1 | 117.8 | 18 $^{5}$ | 11.5 | SW-SM | A-1-b |
| 2 | B | 1 1/2-2 | 7 | 16 | 18 | 39 | 9 | 11 | 14 | NP | 10.4 | 124.3 | 32 $^{2}$ | 10.0 | SM | A-2-4 |
|  | C | 3-8 | 24 | 23 | 34 | 12 | 4 | 3 | NP | NP | 8.8 | 123.6 | 27 $^{5}$ | 9.5 | SW-SM | A-1-b |
| 3 | B | 1 1/2-2 1/2 | 1 | 0 | 3 | 18 | 32 | 46 | 44 | 20 | 19.8 | 108.6 | 6 $^{5}$ | 18.3 | CL | A-7-6(13) |
|  | C | 3-4 | 1 | 1 | 4 | 18 | 33 | 43 | 37 | 17 | 17.6 | 111.0 | 6 $^{5}$ | 17.1 | CL | A-6(11) |
| 4 | B | 1-2 1/2 | 2 | 1 | 5 | 18 | 34 | 40 | 24 | 9 | 17.4 | 111.9 | 7 $^{3}$ | 14.3 | CL | A-4(7) |
|  | C | 2 1/2-4 | 1 | 3 | 6 | 13 | 40 | 37 | 28 | 12 | 14.6 | 117.2 | 7 $^{5}$ | 14.8 | CL | A-6(9) |
| 5 | B | 3/4-2 1/2 | 8 | 16 | 14 | 42 | 10 | 10 | 12 | NP | 12.7 | 121.5 | -- | -- | SM | A-2-4 |
|  | C | 2 1/2-4 | 12 | 17 | 28 | 29 | 7 | 7 | NP | NP | 11.7 | 122.8 | 36 $^{1}$ | 10.3 | SM | A-1-b |
| 6 | B | 1 1/2-6 | 8 | 13 | 17 | 32 | 15 | 15 | 16 | NP | 12.3 | 120.0 | 19 $^{2}$ | 9.1 | SM | A-2-4 |
|  | C | 6-7 | 2 | 3 | 16 | 70 | 5 | 4 | NP | NP | 12.6 | 112.4 | 20 $^{3}$ | 12.7 | SP-SM | A-3 |
| 7 | B | 1 1/2-5 | 1 | 0 | 3 | 30 | 28 | 38 | 37 | 18 | 19.6 | 105.5 | 6 $^{5}$ | 19.9 | CL | A-6(9) |
|  | C | 5 1/2-8 | 3 | 3 | 6 | 24 | 37 | 27 | 24 | 10 | 12.9 | 116.6 | 3 $^{5}$ | 12.9 | CL | A-4(6) |
| 8 | B | 1 1/2-3 1/2 | 1 | 1 | 8 | 39 | 21 | 30 | 31 | 15 | 14.7 | 113.6 | 4 $^{5}$ | 14.9 | CL | A-6(5) |
|  | C | 3 1/2-4 | 2 | 3 | 6 | 25 | 27 | 37 | 31 | 15 | 16.8 | 111.2 | 3 $^{5}$ | 17.1 | CL | A-6(8) |
| 9 | B | 1-2 | 2 | 1 | 4 | 18 | 27 | 48 | 43 | 23 | 16.5 | 109.2 | -- | -- | CL | A-7-6(14) |
|  | C | 2-2 1/2 | 2 | 2 | 6 | 16 | 31 | 43 | 38 | 19 | 17.6 | 108.1 | 4 $^{5}$ | 17.9 | CL | A-6(11) |
| 10 | B | 1 1/2-3 | 7 | 8 | 15 | 43 | 12 | 15 | 15 | NP | 10.7 | 124.2 | 6 $^{5}$ | 11.2 | SM | A-2-4 |
|  | C | 10-13 | 7 | 9 | 38 | 40 | 2 | 4 | NP | NP | 10.4 | 117.6 | 22 $^{5}$ | 9.9 | SP-SM | A-1-b |
| 11 | B | 1-3 | 0 | 1 | 3 | 11 | 41 | 44 | 37 | 17 | 20.5 | 105.0 | 4 $^{5}$ | 20.3 | CL | A-6(11) |
|  | C | 3-4 1/2 | 0 | 0 | 1 | 1 | 41 | 57 | 43 | 19 | 21.2 | 104.2 | 4 $^{4}$ | 23.4 | CL | A-7-6(12) |

| Site No. | Horizon | Depth in Ft. | Gr<br>% Re | CBR<br>- 15#<br>- 20#<br>- 25#<br>- 30#<br>- 35# | Moisture Content for CBR Test | Unified Classification | AASHO Classification |
|---|---|---|---|---|---|---|---|
| 12 | C | 4-5 | | 29$^{1}$ | 10.8 | SP-SM | A-1-b |
| 13 | B | 3/4-3 | | 11$^{5}$ | 14.7 | CL | A-6(8) |
| | C | 3-4 | | 3$^{5}$ | 14.5 | CL | A-6(7) |
| 14 | C | 1-3 | | 1$^{5}$ | 25.0 | CL | A-6(10) |
| | D | 3-6 | | -- | -- | CH | A-7-5(20) |
| 15 | B | 3/4-2 1/2 | | -- | -- | CL | A-7-6(15) |
| | C | 2 1/2-3 1/2 | | 6$^{5}$ | 19.3 | CL | A-7-6(13) |
| 16 | B | 1-1 1/2 | | 4$^{5}$ | 21.1 | CL | A-6(10) |
| | C | 1 1/2-2 1/2 | | 7$^{5}$ | 16.5 | CL | A-6(9) |
| 17 | B | 1-2 | | 5$^{5}$ | 14.8 | CL | A-4(6) |
| | C | 5-6 1/2 | | 3$^{5}$ | 11.2 | SM | A-4(1) |
| 18 | B | 3/4-2 | | 11$^{5}$ | 12.4 | SC | A-2-4 |
| | C | 2-4 | | 30$^{1}$ | 12.5 | SW-SM | A-1-b |
| 19 | B | 1-3 | | 11$^{5}$ | 18.1 | CL | A-6(11) |
| | C | 6 1/2-8 | | 9$^{5}$ | 10.0 | CL | A-4(4) |
| 20 | B | 1 1/4-3 1/4 | | 7$^{5}$ | 15.0 | CL | A-6(7) |
| | C | 3 1/4-6 | | 26$^{5}$ | 10.3 | SW-SM | A-1-b |
| 21 | B | 1/2-3 | | -- | -- | ML-CL | A-4(5) |
| | C | 5-7 | | 4$^{2}$ | 11.1 | ML | A-4(3) |
| 22 | B | 3/4-2 | | 3$^{5}$ | 20.3 | CL | A-7-6(12) |
| | C | 3-4 1/2 | | 4$^{5}$ | 15.7 | CL | A-6(10) |
| 23 | B | 3/4-2 | | 3$^{5}$ | 16.6 | CL | A-6(8) |
| | C | 2-3 | | 7$^{3}$ | 14.8 | ML-CL | A-4(6) |

TABLE II (continued)

| Site No. | Horizon | Depth in Ft. | Grain Size Distribution | | | | | | Liquid Limit % | Plastic Index % | Standard Laboratory Compaction (AASHO T99) | | CBR 1 - 15# 2 - 20# 3 - 25# 4 - 30# 5 - 35# | Moisture Content for CBR Test | Unified Classification | AASHO Classification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Gravel % Retained on #4 | Fine Gravel % Reteined #4-#10 | Coarse Sand % Retained #10-#40 | Fine Sand % Retained #40-#200 | Silt % #200 0.005 mm | Clay % #200 mm | | | O.M.C. % | Max. Dry Weight pcf | | | | |
| 12 | C | 4-5 | 10 | 16 | 24 | 38 | 8 | 4 | NP | NP | 11.1 | 116.9 | $29^{1}$ | 10.8 | SP-SM | A-1-b |
| 13 | B | 3/4-3 | 1 | 1 | 6 | 31 | 27 | 34 | 34 | 18 | 15.0 | 112.6 | $11^{5}$ | 14.7 | CL | A-6(8) |
| | C | 3-4 | 5 | 3 | 6 | 21 | 30 | 35 | 29 | 12 | 13.9 | 116.1 | $3^{5}$ | 14.5 | CL | A-6(7) |
| 14 | C | 1-3 | 0 | 1 | 4 | 21 | 39 | 35 | 40 | 16 | 24.7 | 95.2 | $1^{5}$ | 25.0 | CL | A-6(10) |
| | D | 3-6 | 0 | 0 | 2 | 3 | 35 | 60 | 92 | 55 | 27.5 | 79.0 | -- | -- | CH | A-7-5(20) |
| 15 | B | 3/4-2 1/2 | 2 | 1 | 4 | 12 | 28 | 53 | 44 | 24 | 17.8 | 106.1 | -- | -- | CL | A-7-6(15) |
| | C | 2 1/2-3 1/2 | 2 | 1 | 4 | 12 | 29 | 52 | 42 | 22 | 18.5 | 107.4 | $6^{5}$ | 19.3 | CL | A-7-6(13) |
| 16 | B | 1-1 1/2 | 2 | 1 | 4 | 21 | 28 | 44 | 40 | 18 | 20.6 | 104.0 | $4^{5}$ | 21.1 | CL | A-6(10) |
| | C | 1 1/2-2 1/2 | 1 | 2 | 5 | 20 | 32 | 40 | 36 | 16 | 16.5 | 111.4 | $7^{5}$ | 16.5 | CL | A-6(9) |
| 17 | B | 1-2 | 3 | 2 | 4 | 25 | 35 | 31 | 23 | 8 | 14.8 | 115.7 | $5^{5}$ | 14.8 | CL | A-4(6) |
| | C | 5-6 1/2 | 14 | 7 | 11 | 30 | 23 | 15 | 14 | NP | 11.2 | 126.7 | $3^{5}$ | 11.2 | SM | A-4(1) |
| 18 | B | 3/4-2 | 24 | 5 | 16 | 23 | 15 | 17 | 22 | 8 | 12.6 | 119.4 | $11^{5}$ | 12.4 | SC | A-2-4 |
| | C | 2-4 | 19 | 23 | 31 | 18 | 5 | 4 | NP | NP | 11.0 | 123.8 | $30^{1}$ | 12.5 | SW-SM | A-1-b |
| 19 | B | 1-3 | 0 | 0 | 1 | 7 | 43 | 49 | 40 | 18 | 18.9 | 105.2 | $11^{5}$ | 18.1 | CL | A-6(11) |
| | C | 6 1/2-8 | 2 | 2 | 8 | 31 | 34 | 23 | 21 | 8 | 9.9 | 127.5 | $9^{5}$ | 10.0 | CL | A-4(4) |
| 20 | B | 1 1/4-3 1/4 | 2 | 1 | 9 | 27 | 21 | 40 | 29 | 14 | 15.6 | 114.0 | $7^{5}$ | 15.0 | CL | A-6(7) |
| | C | 3 1/4-6 | 6 | 7 | 51 | 28 | 5 | 3 | NP | NP | 10.3 | 115.4 | $26^{5}$ | 10.3 | SW-SM | A-1-b |
| 21 | B | 1/2-3 | 4 | 2 | 9 | 27 | 23 | 35 | 23 | 7 | 16.0 | 112.0 | -- | -- | ML-CL | A-4(5) |
| | C | 5-7 | 14 | 5 | 8 | 22 | 33 | 18 | 19 | NP | 12.3 | 121.0 | $4^{2}$ | 11.1 | ML | A-4(3) |
| 22 | B | 3/4-2 | 11 | 3 | 5 | 15 | 24 | 42 | 43 | 22 | 20.3 | 104.1 | $3^{5}$ | 20.3 | CL | A-7-6(12) |
| | C | 3-4 1/2 | 5 | 1 | 4 | 15 | 32 | 43 | 32 | 15 | 16.3 | 113.9 | $4^{5}$ | 15.7 | CL | A-6(10) |
| 23 | B | 3/4-2 | 4 | 2 | 5 | 25 | 30 | 34 | 36 | 15 | 17.0 | 108.3 | $3^{5}$ | 16.6 | CL | A-6(8) |
| | C | 2-3 | 5 | 3 | 8 | 20 | 34 | 30 | 23 | 7 | 12.4 | 122.4 | $7^{3}$ | 14.8 | ML-CL | A-4(6) |

| Site No. | Horizon | Depth in Ft. | Gr % Re | CBR - 15# - 20# - 25# - 30# - 35# | Moisture Content for CBR Test | Unified Classification | AASHO Classification |
|---|---|---|---|---|---|---|---|
| 24 | B | 1/2-2 1/2 | | 3[5] | 13.4 | SM-SC | A-2-4 |
| | C | 2 1/2-3 1/2 | | --- | --- | SM | A-2-4 |
| 25 | B | 3/4-2 1/2 | | 10 | 12.1 | SC | A-2-4 |
| | C | 2 1/2-6 3/4 | | 19 | 11.9 | SW-SM | A-1-b |
| 26 | B | 1/2-1 1/4 | | 6[5] | 22.6 | CL | A-7-6(14) |
| | C | 1 1/4-2 1/2 | | 4[5] | 16.7 | CL | A-6(11) |
| 27 | B | 3/4-2 | | 3[5] | 21.2 | CL | A-7-6(13) |
| | C | 2-3 | | --- | --- | CL | A-6(10) |
| 28 | B | 1/3-1 | | 3[5] | 22.8 | CL | A-7-6(14) |
| | C | 1-2 | | 7[5] | 17.4 | CL | A-6(11) |
| 29 | B | 3/4-1 1/2 | | 6[5] | 19.0 | CL | A-6(14) |
| | C | 1 1/2-3 | | --- | --- | CL | A-6(11) |
| 30 | B | 3/4-3 | | 7[5] | 19.3 | CL | A-7-6(12) |
| | C | 3-4 | | 7[5] | 16.5 | CL | A-6(9) |
| 31 | B | 3/4-3 1/2 | | 9[5] | 18.8 | CL | A-7-6(14) |
| | C | 3 1/2-5 | | 11[5] | 12.4 | SC | A-7-6(6) |
| 32 | B | 3/4-2 3/4 | | 10[5] | 10.5 | SM | A-4(1) |
| | C | 3-5 | | 25[5] | 10.0 | SP-SM | A-1-b |

TABLE II (continued)

| | | | Grain Size Distribution | | | | | | | | Standard Laboratory Compaction (AASHO T99) | | CBR 1 - 15# 2 - 20# 3 - 25# 4 - 30# 5 - 35# | Moisture Content for CBR Test | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site No. | Hori-zon | Depth in Ft. | Gravel % Retained on #4 | Fine Gravel % Retained #4-#10 | Coarse Sand % Retained #10-#40 | Fine Sand % Retained #40-#200 | Silt % #200 0.005 mm | Clay % #200 mm | Liquid Limit % | Plastic Index % | O.M.C. % | Max. Dry Weight pcf | | | Unified Classifi-cation | AASHO Classifi-cation |
| 24 | B | 1/2-2 1/2 | 10 | 7 | 16 | 32 | 23 | 12 | 21 | 5 | 14.0 | 116.2 | 3 $^{5}$ | 13.4 | SM-SC | A-2-4 |
| | C | 2 1/2-3 1/2 | 11 | 12 | 16 | 38 | 13 | 10 | NP | NP | 9.3 | 122.0 | — | — | SM | A-2-4 |
| 25 | B | 3/4-2 1/2 | 8 | 12 | 21 | 23 | 8 | 17 | 25 | 10 | 11.7 | 122.0 | 10 | 12.1 | SC | A-2-4 |
| | C | 2 1/2-6 3/4 | 29 | 16 | 33 | 15 | 5 | 2 | NP | NP | 12.1 | 119.1 | 19 | 11.9 | SW-SM | A-1-b |
| 26 | B | 1/2-1 1/4 | 1 | 0 | 4 | 15 | 26 | 54 | 46 | 23 | 23.0 | 98.7 | 6 $^{5}$ | 22.6 | CL | A-7-6(14) |
| | C | 1 1/4-2 1/2 | 1 | 2 | 3 | 13 | 31 | 50 | 37 | 18 | 16.5 | 111.2 | 4 $^{5}$ | 16.7 | CL | A-6(11) |
| 27 | B | 3/4-2 | 0 | 1 | 4 | 22 | 32 | 41 | 41 | 22 | 20.8 | 105.8 | 3 $^{5}$ | 21.2 | CL | A-7-6(13) |
| | C | 2-3 | 1 | 1 | 4 | 18 | 31 | 45 | 34 | 16 | 17.4 | 111.1 | — | — | CL | A-6(10) |
| 28 | B | 1/3-1 | 0 | 1 | 3 | 15 | 29 | 52 | 44 | 22 | 22.3 | 100.8 | 3 $^{5}$ | 22.8 | CL | A-7-6(14) |
| | C | 1-2 | 6 | 1 | 3 | 13 | 33 | 44 | 36 | 18 | 18.6 | 107.0 | 7 $^{5}$ | 17.4 | CL | A-6(11) |
| 29 | B | 3/4-1 1/2 | 1 | 0 | 2 | 15 | 37 | 45 | 40 | 24 | 19.0 | 105.4 | 6 $^{5}$ | 19.0 | CL | A-6(14) |
| | C | 1 1/2-3 | 4 | 2 | 5 | 15 | 39 | 35 | 35 | 17 | 15.9 | 110.0 | — | — | CL | A-6(11) |
| 30 | B | 3/4-3 | 7 | 0 | 5 | 20 | 24 | 44 | 44 | 21 | 19.1 | 107.9 | 7 $^{5}$ | 19.3 | CL | A-7-6(12) |
| | C | 3-4 | 5 | 1 | 6 | 24 | 28 | 36 | 32 | 17 | 16.1 | 113.0 | 7 $^{5}$ | 16.5 | CL | A-6(9) |
| 31 | B | 3/4-3 1/2 | 1 | 1 | 8 | 21 | 29 | 40 | 47 | 24 | 18.6 | 103.5 | 9 $^{5}$ | 18.8 | CL | A-7-6(14) |
| | C | 3 1/2-5 | 14 | 3 | 7 | 31 | 20 | 25 | 44 | 23 | 13.0 | 119.3 | 11 $^{5}$ | 12.4 | SC | A-7-6(6) |
| 32 | B | 3/4-2 3/4 | 12 | 6 | 14 | 30 | 18 | 20 | 17 | 2 | 10.6 | 121.1 | 10 $^{5}$ | 10.5 | SM | A-4(1) |
| | C | 3-5 | 29 | 13 | 25 | 26 | 3 | 4 | NP | NP | 10.9 | 124.1 | 25 $^{5}$ | 10.0 | SP-SM | A-1-b |

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JHRP - 61/30

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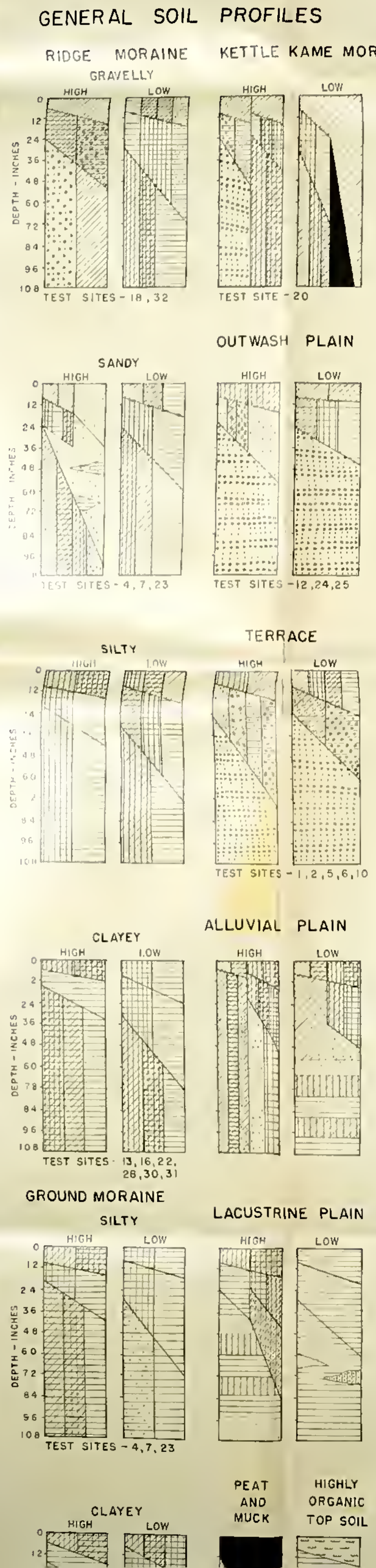
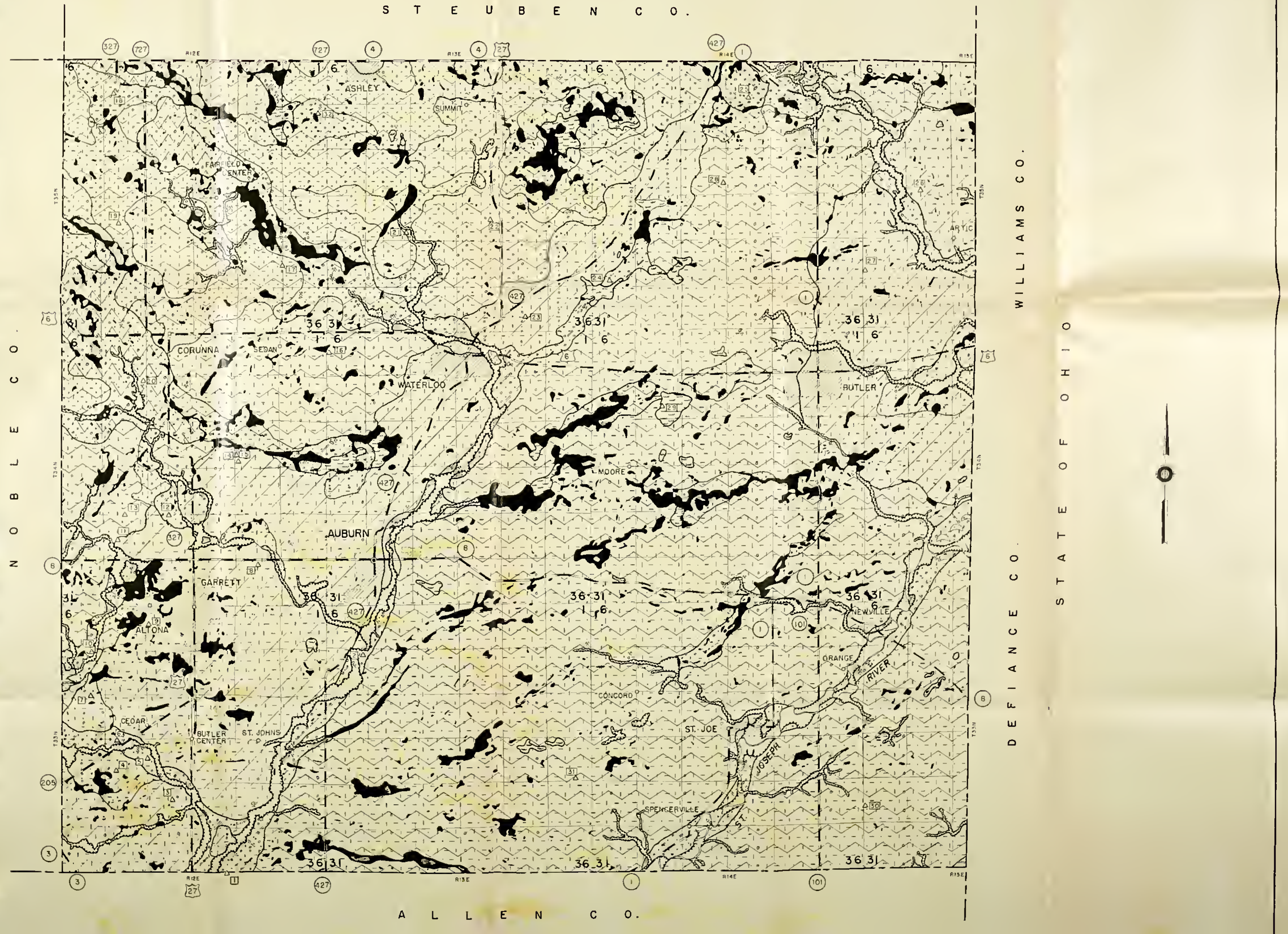
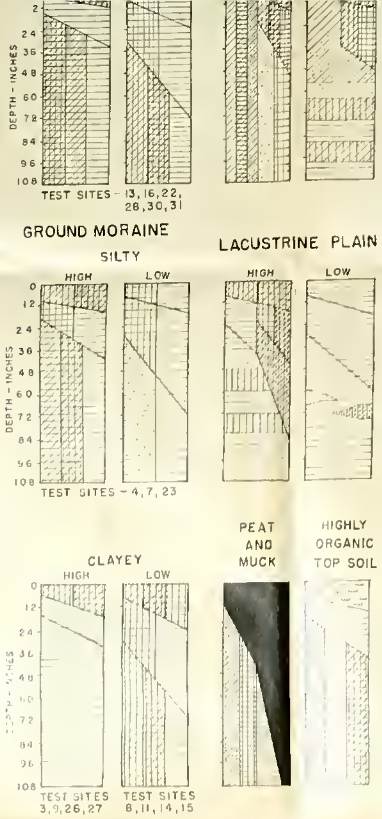
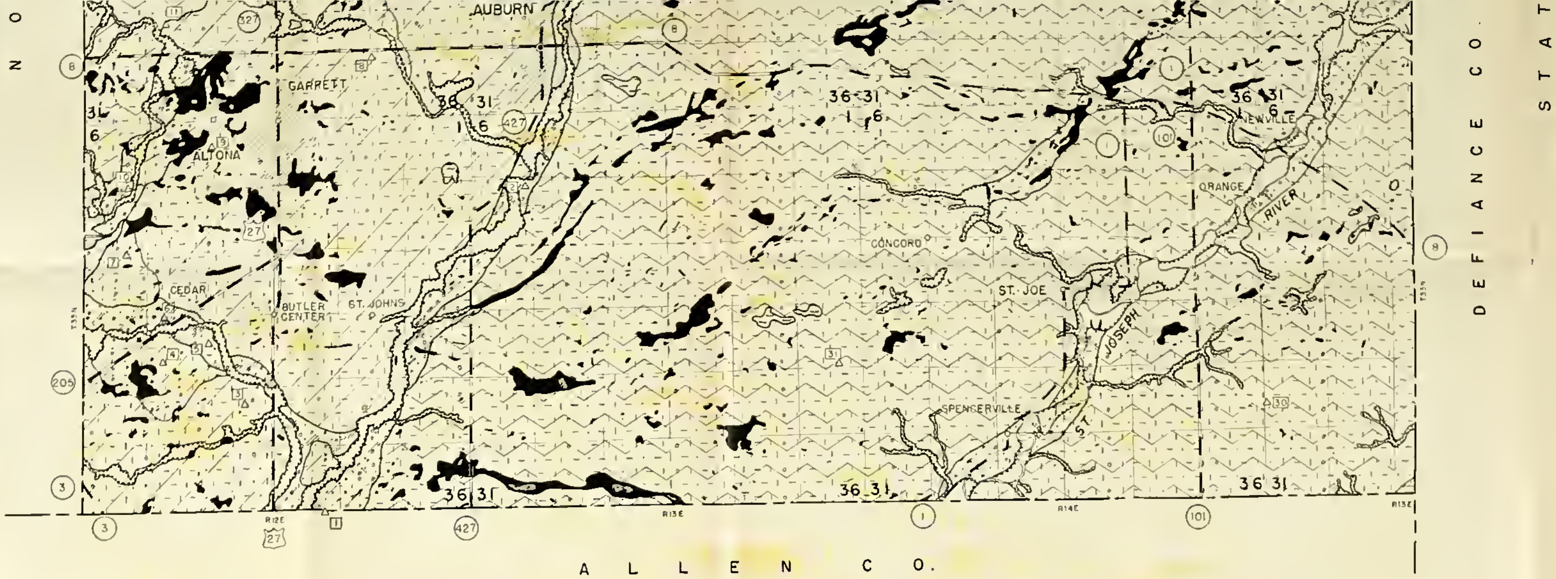
# GENERAL SOIL PROFILES









SOIL CLASSIFI[illegible] [illegible] STUDIES

| Description | Grain Size Distribution |  |  |  | Plastic Index | Symbol |
|---|---|---|---|---|---|---|
|  | Gravel % Retained on #10 | Sand % Passing #10-#200 | Silt % [illegible] 0.0[illegible]-0.005mm | Clay less than 0.005mm |  |  |
| Gravel | [illegible]-100 | 0-15 | 0-10 | 0-10 | NP | ▨ |
| Sandy Gravel | 50-85 | [illegible]-50 | 0-10 | 0-10 | 6 Max. | ▨ |
| Sand | 0-15 | [illegible]-100 | 0-10 | 0-10 | NP | ▨ |
| Gravelly Sand | 20-49 | [illegible]-85 | 0-10 | 0-10 | 6 Max. | ▨ |
| Sandy Loam | 0-19 | [illegible] | 0-50 | 0-20 | 6 Max. | ▨ |
| Sandy Clay Loam | 0-19 | [illegible]-30 | 0-30 | 20-30 | 10 Max. | ▨ |
| Sandy Clay | 0-19 | 55-70 | 0-15 | 30-45 | 11 Min. | ▨ |
| Loam | 0-19 | [illegible]-50 | 30-50 | 0-20 | 10 Max. | ▨ |
| Silt Loam | 0-19 | 0-50 | 50-100 | 0-20 | 10 Max. | ▨ |
| Silty Clay Loam | 0-19 | 0-30 | 70-100 | 20-30 | 11 Min. | ▨ |
| Silty Clay | 0-19 | 0-15 | [illegible]-70 | 30-45 | 11 Min. | ▨ |
| Clay Loam | 0-19 | 20-50 | [illegible] | 20-30 | 11 Min. | ▨ |
| Clay | 0-19 | 0-55 | 0-55 | 30-100 | 11 Min. | ▨ |
| Peat or Muck |  |  |  |  |  | ■ |
| Organic Matter |  |  |  |  |  | ▨ |
| Top Soil |  |  |  |  |  | ▨ |

Classification of Gravelly Soils

85%-100% gravel plus finer material - Gravel
50%-84% gravel plus finer material - Clayey, silty or sandy gravel
20%-49% gravel plus finer material - Use fine classification and called gravelly sand, gravelly silt or gravelly clay
0%-19% gravel plus finer material - Use fine classification only

# ENGINEERING SOILS MAP
# DEKALB COUNTY
## INDIANA

PREPARED FROM
1939 AAA AERIAL PHOTOGRAPHS
BY
JOINT HIGHWAY RESEARCH PROJECT
AT
PURDUE UNIVERSITY

1961

SCALE OF MILES
1 3/4 1/2 1/4 0 1 2 3 4

## LEGEND

### PARENT MATERIALS (GROUPED ACCORDING TO LAND FORM AND ORIGIN)

- ▨ KETTLE KAME MORAINE
- ▨ RIDGE MORAINE
- ▨ GROUND MORAINE
- ▨ OUTWASH PLAIN
- ▨ VALLEY TRAIN TERRACE
- ▨ SAND DUNE
- ▨ ESKER
- ■ PEAT AND MUCK
- ▨ LACUSTRINE PLAIN
- ▨ ALLUVIAL PLAIN

### MISCELLANEOUS

- ⚒ GRAVEL PIT
- ▨ LAKE AND POND
- ▨ HIGHLY ORGANIC TOPSOIL

### TEXTURAL SYMBOLS (SUPERIMPOSED ON PARENT MATERIAL SYMBOLS TO SHOW RELATIVE COMPOSITION)

- ▨ GRAVEL
- ▨ SAND
- ▨ SILT
- ▨ CLAY

PREPARED UNDER THE SUPERVISION OF : P. T. YEH

POLYCONIC PROJECTION

DRAWN BY F. E. DONALDSON